Observations and Simulation of Seasonal Variability within the Straits of Georgia and Juan de Fuca

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Abstract

The Strait of Georgia is a large semi-enclosed estuary on the southern coast of British Columbia. The main connection to the Pacific is to the south, through Juan de Fuca Strait. Abundant freshwater discharge, mainly from the Fraser River, forces a two-way exchange with oceanic shelf water. The resulting circulation is forced by tides, wind stress, and freshwater discharge. Both the coastal wind stress and the flux of freshwater are subject to strong seasonal modulations, producing a marked seasonal cycle in the water properties of the region.

Several time series of extended length have been examined in terms of the seasonal response and results are compared with output from numerical simulations with the Princeton Ocean Model (POM). The model, forced with tides, seasonal wind stress and freshwater discharge, is integrated over several years until the system approaches statistical equilibrium. The results show good agreement with observations from Juan de Fuca Strait, as well as over the upper part of the water column within the Strait of Georgia. However, simulation of the seasonal cycle of the deeper water in the Strait of Georgia is more problematic. The deep water properties apparently are determined by a complex balance between dense intrusions from the sill area and local vertical mixing.